



# NOAA's Hydrographic Surveys: Requirements and Current Conops

*AUV Workshop-Oceans '12  
Virginia Beach, VA*



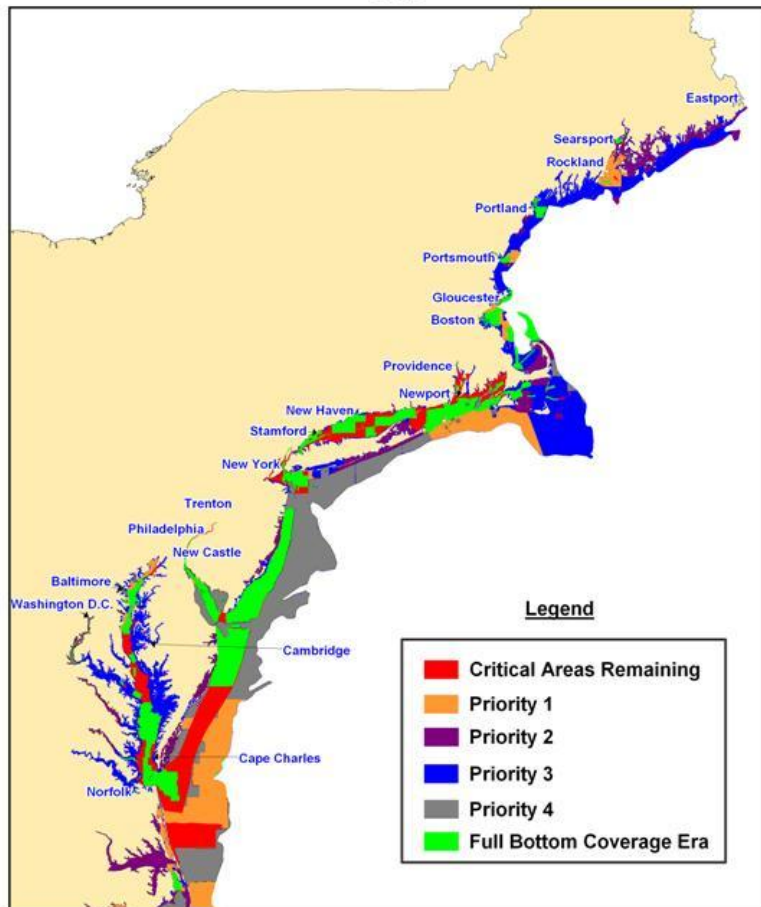
Slide Credit:  
CCOM/JHC

# National Hydrographic Survey Priorities

## NOAA Hydrographic Survey Priorities - East Coast

Northeast States

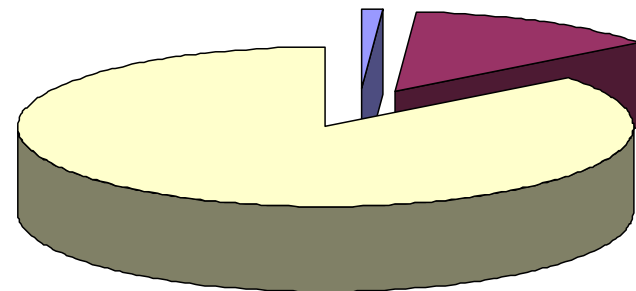
2010



**Critical Area: 43,000 snm**  
**Navigationally Significant Area: 537,000 snm**

**\*snm = square nautical miles**

Chart of Total area of responsibility, Navigationally significant and Critical Area



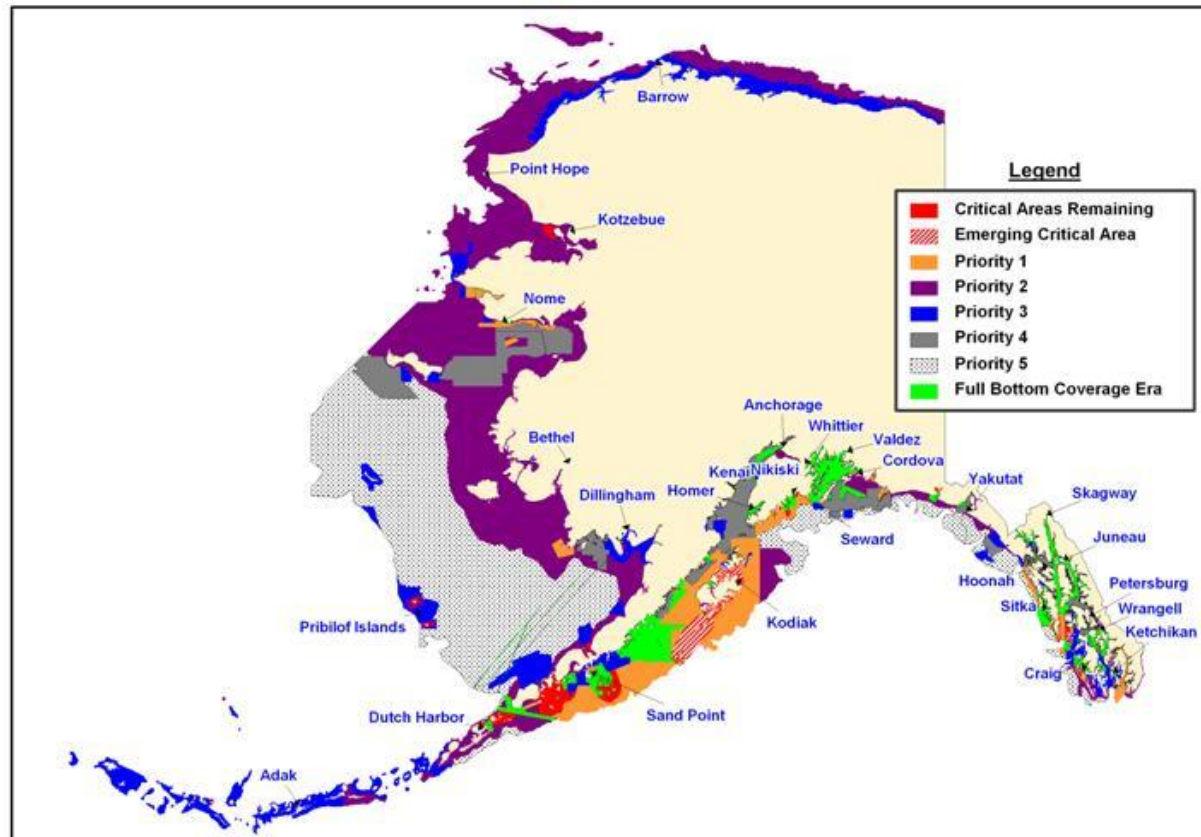
■ Critical Area ■ Navigationally Significant Area ■ Total Area of responsibility

# National Hydrographic Survey Priorities

## Navigationally Significant, Critical, and Re-Survey Areas

### NOAA Hydrographic Survey Priorities - Alaska

2010



# Hydro Survey Standards

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## ● Object Detection-1m cube

- Met by SSS or high resolution multibeam
- Required in ports and approaches <20m depth

## ● Accuracy

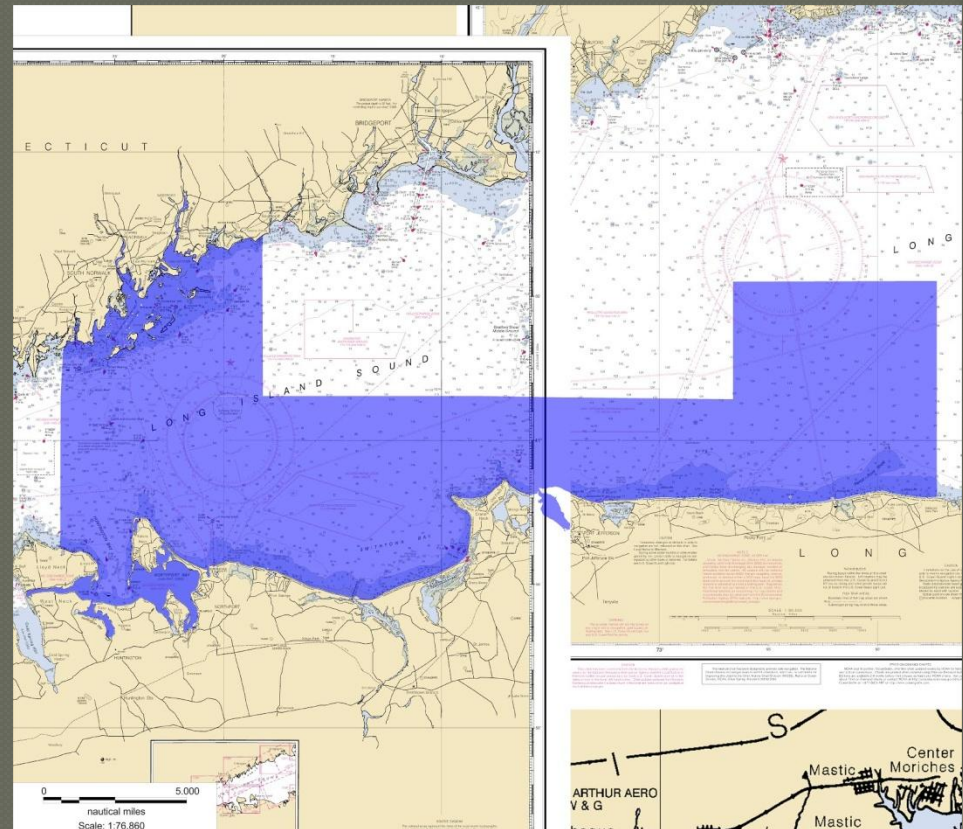
- 0.5m vertical, slowly increases with depth

## ● Resolution

- 1m grid, 95% populated to 20m depth, scales linearly with depth thereafter.

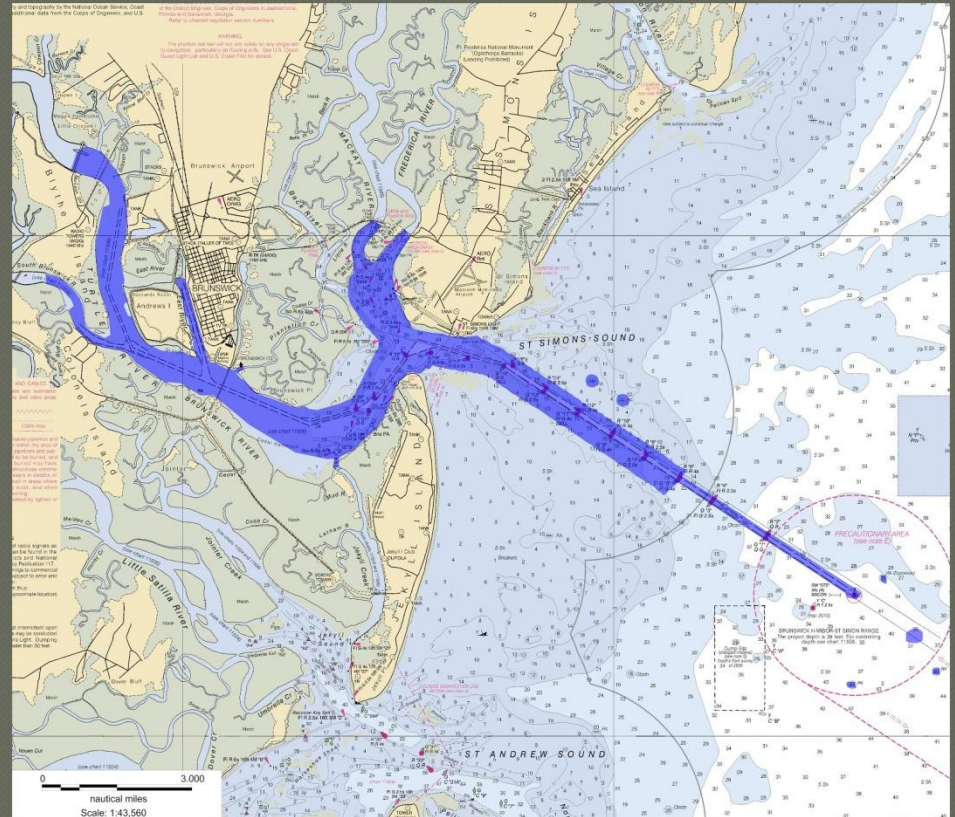
# Example Project 1-Basic Survey

- Long Island Sound
- 0-35 m depth
- Commercial and recreational traffic
- ~1 kt of current, dense lobster pots
- Up to 35 miles from small port
- Approximately 5000 LNM



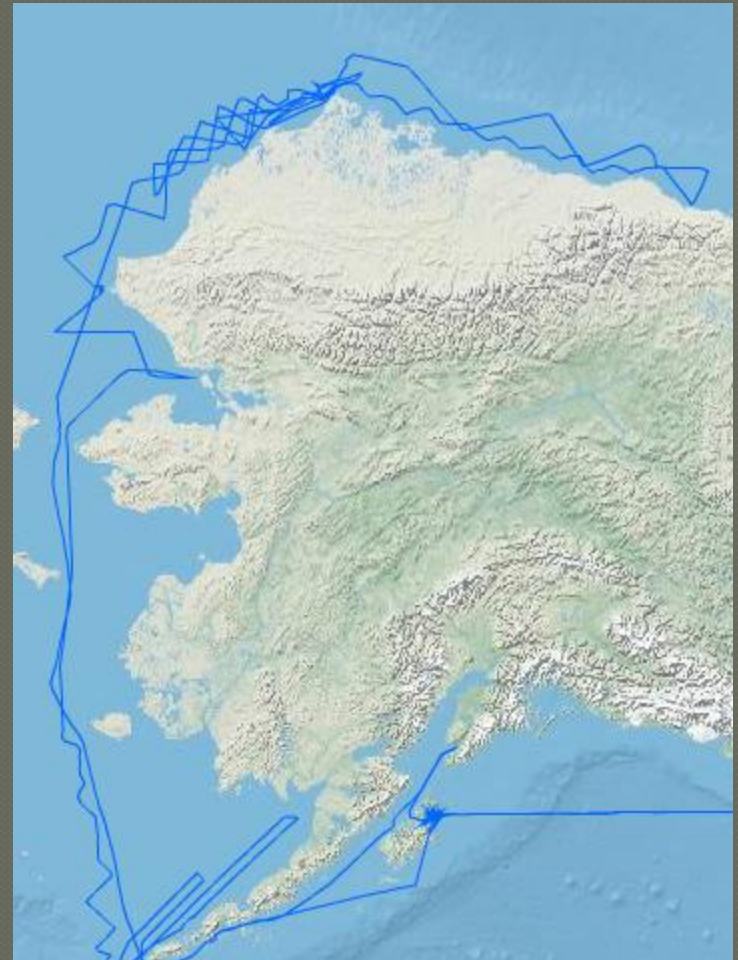
# Example Project 2-Response

- Port to sea buoy
- Concentration on channels and waterways
- Looking for hazardous debris and shoaling
- Sidescan Sonar
- Quick turnaround to local customers
- Heavy traffic
- 0-20m depth



# Example Project 3-Arctic Recon

- ◉ Incomplete but accurate coverage within corridor
- ◉ Used to focus follow-up surveys
- ◉ Short season, huge areas and distances, limited support resources



# Current Operations-Sensors

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## ● Multibeam Sonars

- Paired with motion sensors and periodic full water column sound speed measurements
- Coverage scales linearly with depth-typically used >4m depth
- Data Rate ~0.5-2GB/hr

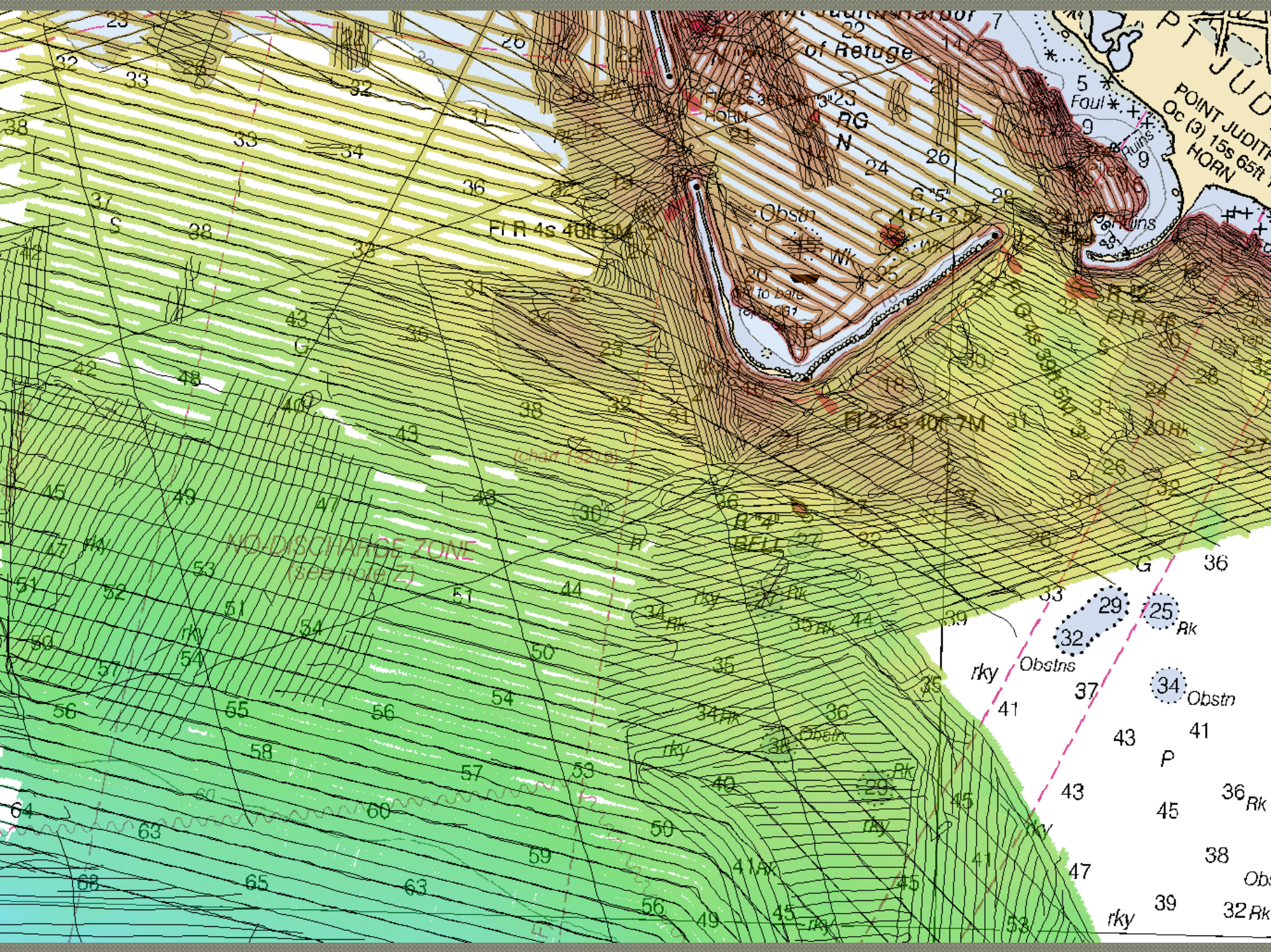
## ● Sidescan Sonars

- Used to locate discrete features (rocks, wrecks, obstructions)-usually less than 30m depth
- Careful multibeam development needed to get least depth for charting
- Data Rate ~1-2GB/hr

# Current Operations-Platforms

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- 4 NOAA Ships (two on each coast), carrying survey-capable launches
  - Ships can collect approx 200 linear survey miles per day, launches about 30 miles.
  - On-board mission planning, data processing, mechanical support and electronics support.
- Navigation Response Teams
  - Trailerable 27' boats, multibeam and SSS equipped
  - Smaller projects in protected waters.
- Contract survey firms
  - Platform and sensor choices are similar



# *Potential AUV Conops Force Multiplier on Hydro Ship*

## *Operational Concept*

- Bathymetric Mapping AUVs deployed from NOAA hydrographic survey vessels to increase data acquisition rates
- Complement to ship and launches for simple mission profiles
- Manned resources freed to focus on complex survey requirements



# *Potential AUV Conops- Emergency Response*

## *Operational Concept*

- First response for maritime incidents and post-storm surveys.
- Small AUVs with side scan sonar for detection of submerged hazards to navigation.

## *Functional Requirements*

- Operating Platforms – Shore, small boats, and vessels of opportunity
- Operating Environment – Ports and harbors
- Operating Mode – Fully Autonomous (vs Monitored or Attended)
- Unique Requirements – Highly portable, self-contained systems



## Operational Concept

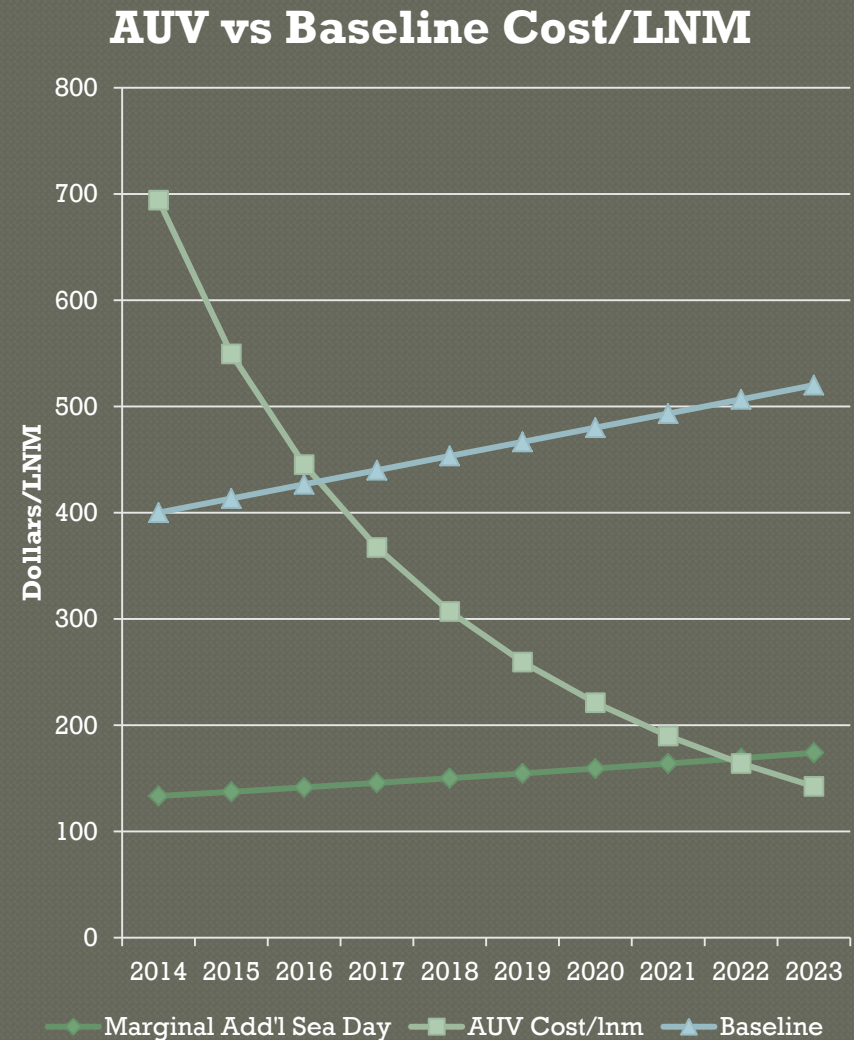
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- Fairweather 2012 Arctic Reconnaissance**
- BERING SEA**
- Pelly Bay**
- USCGS & NOAA Hydrographic Surveys (by decade)**
- 1890 - 1899
  - 1900 - 1909
  - 1910 - 1919
  - 1920 - 1929
  - 1930 - 1939
  - 1940 - 1949
  - 1950 - 1959
  - 1960 - 1969
  - 1970 - 1979
  - 1980 - 1989
  - 1990 - 1999
  - 2000 - 2009
  - 2010 - 2019
- Nautical Miles
- Scale: 0 to 500 Nautical Miles

# Challenge

- Run the numbers.
- Develop appealing paper concepts of operations-better, faster or cheaper
- Account for all costs-personnel, maintenance, replacement/loss rates, support
- Realistic estimates of output

# Example

- Loss rates reduced 5%/year
- Purchase cost flat
- AUV Speed increases by 5%/year
- Endurance increases 5%/year
- Spreadsheet developed to work with what-if scenarios



# Hydrographic Specifications

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## ● 2012 Specifications and Deliverables

- Used by both NOAA and Contractors
- Updated every year and available on-line
- <http://www.nauticalcharts.noaa.gov/hsd/specs/specs.htm>
- Based on IHO SP44 for Order 1 surveys
- Describes report contents, data formats, accuracy requirements, etc. etc.
- Gridded data specifications
  - Grid resolution, soundings per node, propagation distances, etc.

# Important NOAA Hydrographic Contacts & Website

- Jeffrey Ferguson, Chief, Hydrographic Surveys Division,  
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- LCDR Marc Moser, Chief, Operations Branch, 301-713-2700 ext. 112
- Rob Downs, AUV Hydrographic Program Manager ([rob.downs@noaa.gov](mailto:rob.downs@noaa.gov))  
301-713-2653 ext. 148

[www.noaa.gov](http://www.noaa.gov)

[www.nauticalcharts.noaa.gov](http://www.nauticalcharts.noaa.gov) – Office of Coast Survey

[www.nauticalcharts.noaa.gov/hsd/hydrog.htm](http://www.nauticalcharts.noaa.gov/hsd/hydrog.htm) – Hydrographic Surveys